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Psychopathy Factor Interactions and Co-Occurring Psychopathology: Does Measurement Approach Matter?

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Abstract

The two dimensions of psychopathy as operationalized by various measurement tools show differential associations with psychopathology; however, evidence suggests that the statistical *interaction* of Factor 1 (F1) and Factor 2 (F2) may be important in understanding associations with psychopathology. Findings regarding the interactive effects of F1 and F2 are mixed, as both potentiating and protective effects have emerged. Moreover, approaches to measuring F1 (e.g. clinical interview versus self-report) are based on different conceptualizations of F1, which may influence the interactive effects. The current study aims to 1) elucidate the influence of F1 and F2 on psychopathology by using both variable-centered and person-centered approaches and 2) determine if the measurement of F1 influences the interactive effects of F1 and F2 by comparing the strength of interactive effects across F1 measures in a sample of over 1,500 offenders. Across analytic methods, there were very few cases in which F1 statistically influenced the association between F2 and psychopathology, such that F1 failed to evidence either potentiating or protective effects on F2. Furthermore, the conceptualization of F1 across psychopathy measures did not impact the interactive effects of F1 and F2. These findings suggest that F2 is probably driving the relations between psychopathy and other forms of psychopathology, and that F1 may play less of a role in interacting with F2 than previously believed.

Keywords

psychopathy; psychopathology; interactive effects

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Psychopathy is a personality disorder defined by the combined presence of antisocial behavior, an impulsive and irresponsible lifestyle, a grandiose interpersonal style, and deficient affective experience. Multiple studies indicate that psychopathy is associated with criminal behavior; substance misuse; several types of comorbid psychopathology; deliberate self-harm; and suicidal behavior (Poythress et al., 2010; Skeem, Poythress, Edens, Lilienfeld, & Cale, 2003). Dating back to the classic work of Harpur, Hare, & Hakstian (1989), traditional theoretical frameworks have conceptualized psychopathy as consisting of two moderately correlated, overarching dimensions. Factor 1 (F1) encompasses interpersonal and affective traits (e.g., callousness, shallow affect, grandiosity), whereas Factor 2 (F2) captures impulsive-antisocial behavior (e.g. impulsivity, irresponsibility, early behavior problems). Although Hare has identified lower-order facets within these two broad dimensions (Hare, 1991), the two factor model of psychopathy remains the most widely investigated measurement model for this condition (see Fowles, 2011).

Recent research indicates that the two factors show differential associations with environmental stressors (e.g., childhood trauma), psychopathology, and maladaptive outcomes. For instance, F2 traits typically show strong, positive associations with anxiety, depression, substance abuse symptoms, self-harm, suicidal behavior, borderline personality disorder features, childhood abuse and arrest, whereas F1 shows little to no association or negative associations with these variables (Benning, Patrick, Hicks, Blonigen, & Krueger, 2003; Skeem et al., 2003; Skeem, Johansson, Andershed, Kerr, & Louden, 2007). Moreover, F2 displays stronger positive associations with levels of neuroticism, affective psychopathology, non-planning and impulsive aggression compared with F1 traits (Skeem et al., 2003; Warren et al., 2003).

Heterogeneity of Psychopathy Measurement

Several well-validated measures of psychopathy exist, but the most widely used is the Psychopathy Checklist-Revised (PCL-R; Hare, 1991), which assesses F1 and F2, as well as four facets (interpersonal, affective, lifestyle and antisocial) derived from factor analyses (Hare et al., 1990). The PCL-R involves a relatively time consuming (i.e., 1.5-2.5 hours) semi-structured interview and file review that are used by the interviewer to rate the presence of 20 characteristics.

The Psychopathic Personality Inventory (PPI; Lilienfeld & Andrews, 1996) was developed as a self-report measure of psychopathy, and as a more easily administered and less time-consuming alternative to the PCL-R. Nevertheless, the PPI is marked by the standard limitations of self-reports, such as reliance on respondents' insight and honesty, both of which may be particular problems among psychopathic individuals (Lilienfeld, 1994). Most commonly, factor analytic studies report that PPI consists of a three-factor structure: F1 (Fearless Dominance), F2 (Impulsive Antisociality) and Coldheartedness, the last of which does not load appreciably on either factor and is thus treated as a stand-alone factor (Benning, et al., 2003; Patrick et al., 2006; but see Neumann, Malterer, & Newman, 2008, for an alternative factor structure). Some of the traits measured by the PPI differ from those measured by the PCL-R, with the most noticeable difference being the conceptualization and operationalization of F1. Whereas PCL-R F1 assesses interpersonal and affective traits such

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as grandiosity, lack of empathy and callousness (Hare, 1991), PPI-I captures relatively adaptive features of stress immunity, social potency and fearlessness, which are related to such traits as risk taking without fear of consequences, low anxiety and social dominance (Benning et al., 2003; Miller & Lynam, 2012). Indeed, the PPI and PCL-R were intended to assess psychopathy somewhat differently, as the PPI was designed to measure personality dispositions independent of antisocial behaviors, whereas the PCL-R explicitly incorporates such behaviors (Lilienfeld & Andrews, 1996).

Although scores on the PCL-R and PPI both evidence good psychometric properties (Hare, 1991; Lilienfeld & Andrews, 1996), convergent validity findings are mixed when comparing F1 and F2 across measures, especially for F1 given the divergent conceptualizations described earlier. In particular, correlations between PCL-R F1 and PPI-I scores are consistently low (*r*s range from .15 to .24), whereas those between PCL-R F2 and PPI-II scores range from moderate to large across studies (*r*s range from .39 to .58; Malterer et al., 2010; Poythress et al., 2010). The low, albeit positive, correlations for F1 scores suggest that the PCL-R and PPI versions of this dimension are not measuring the same construct. Furthermore, PCL-R F1 and PPI-I show divergent associations with comorbid psychopathology. Specifically, PCL-R F1 tends to show little or no relation (Warren et al., 2003), whereas PPI-I tends to show significant negative associations (Benning et al., 2003).

Potential Interactive Effects of F1 and F2

Several studies suggest that the statistical *interaction* of F1 and F2 is important in understanding associations with negative precursors, comorbid psychopathology, and maladaptive outcomes (Blonigen et al., 2010; Hicks & Patrick, 2006; Sprague et al., 2012). Such interaction is potentially consistent with the notion of at least some forms of psychopathology, especially personality disorders, as comprising interpersonally maladaptive configurations (statistical interactions) of two or more personality traits (Grove & Tellegen, 1991). There are two potential interactive effects: potentiating versus protective. A potentiating effect indicates that high levels of F1 coupled with high levels of F2 increases the risk for negative outcomes. In other words, high levels of F1 would *strengthen* the relationship between F2 and psychopathology and/or maladaptive behaviors. There is some evidence that a potentiating effect may be gender specific. For instance, in a sample of female inpatients at a maximum-security hospital, Coid (1993) found that the combination of F1 and F2 (as indexed by the PCL-R) was associated with emotion dysregulation, intense dysphoria, self-harm and property damage. Likewise, Sprague et al. (2012) found that, across samples (college students, incarcerated women) and measures (PCL-R and PPI), the interaction between F1 and F2 traits significantly predicted borderline personality disorder features. In particular, the association between F2 and borderline traits was stronger when coupled with high F1 scores – but only for females. Finally, Verona, Sprague, and Javdani (2012) showed that, in females, the association between F2 and suicidal ideation/self-harm was enhanced at high levels of F1, whereas in men F2 was associated with suicidal ideation and self-harm regardless of the level of F1. Similar to Sprague et al. (2012), this study used combined scores from the PPI and Self-Report Psychopathy scale for one sample and the PCL:SV for the other.

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In contrast, a protective effect indicates that high levels of F1 coupled with high levels of F2 decrease the risk for negative outcomes. In this case, high levels of F1 would *weaken* the relationship between F2 and psychopathology and/or maladaptive behaviors, serving as a protective factor against negative outcomes. In support of this notion, suppressor effects have been found in association with depression and emotional distress among male inmates such that after controlling for PCL-R F1, the relationship between F2 and psychopathology became stronger (Hicks et al., 2006). Similar effects were found for the PPI and PCL-R among male and female offenders for symptoms of both internalizing and externalizing disorders (Blonigen et al., 2010). Although the statistical procedure of analyzing suppressor effects is not equivalent to the methods used in studies exploring potentiating effects (e.g. Sprague et al., 2012; Verona et al., 2012), the fact that F1 weakens the effect of F2 on psychopathology, indicated by a stronger relationship between F2 and psychopathology after accounting for F1, suggests that F1 may have a protective effect. Furthermore, negative correlations (or, in some cases, a lack of relationship) between F1 and psychopathology, as well as positive correlations between F1 and adaptive characteristics (e.g. intelligence, positive emotionality, academic success, perceived self-efficacy) suggest a protective effect of F1 on F2 (Benning et al., 2003; Hall & Benning, 2006).

These series of studies report that F1 – whether potentiating or protective – affects the relationship between F2 and psychopathology or other maladaptive outcomes. However, it is also important to consider the possibility that F1 is less relevant to such outcomes, in that it may not serve as either a potentiating or protective factor. Indeed, the interactive nature of the two factors of psychopathy in relation to external correlates has been questioned. For instance, a recent meta-analysis (Kennealy, Skeem, Walters, & Camp, 2010) of studies exploring each PCL-R factor and their interaction in predicting violence found that the interaction of these factors did not increase the predictive validity. F2 alone predicted violence better than F1 or their interaction. These effects have been replicated with recidivism (Walters & Duncan, 2005).

Thus, there is a need to further investigate the interaction of F1 and F2 as it is unclear whether F1 has a potentiating or protective effect on F2 in relation to psychopathology. Additionally, the above-discussed studies generally utilized either the PCL-R or the PPI. As such, there is a need to examine if the measurement method of psychopathy - and subsequent conceptualization of F1influences the relationship of the factors to psychopathology. Indeed, conceptualizations of F1 may influence the magnitude of the interaction with F2 in relation to psychopathology and other maladaptive behavior. More importantly, exploring the interactions may also inform current controversies on the utility of F1, particularly Fearless Dominance, and if psychopathy is best characterized by an interaction of F1 and F2 traits.

Approaches to Examining F1-F2 Interplay

There are two general approaches to testing interactions between variables. The most common and straightforward approach to examining between factors is regression-based (Bauer & Shanahan, 2007; Lanza et al., 2011), using an interaction term to predict other variables (e.g., psychopathology) after controlling for main effects. This is referred to as a

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"variable-centered" approach. However, a major drawback to this approach is an increased likelihood of Type II errors (e.g., low power minimizing the ability to detect interactions; Bauer & Shanahan, 2007; Lanza et al., 2011). An alternative method is a "person-centered" approach (e.g., latent class/profile analysis, cluster analysis, mixture models) that classifies individuals into classes or subgroups based on sets of variables or factor scores (e.g. F1 and F2) (Lanza et al., 2011). A "person-centered" approach may be more informative for exploring the "interplay" of factors, as it allows for a more holistic view of variables and the examination of actual individuals who exhibit particular profiles or combinations of factors relative to individuals exhibiting different profiles. However, a limitation to this approach is the loss of statistical power associated with creating subgroups of individuals. Although each approach has its benefits and drawbacks, it provides different yet complementary information relative to the other.

Six prior studies have utilized a person-centered approach to examining subtypes of psychopathy (e.g., Alterman et al., 1998; Haapasalo & Pulkkinen, 1992; Herve et al., 2000; Hicks, Markon, Patrick, Krueger, & Newman, 2004; Skeem et al., 2007; Vassileva et al., 2005) with inconsistent findings regarding both the number (e.g. two, three, four, or six classes) and topography (e.g., variation in combinations of F1 and F2 and defining characteristics) of the classes. Still, there appears to be one point of consistency across these studies. Generally, two groups typically resemble high F1 individuals and high F2 individuals. The high F1 group is marked by low anxiety and low externalizing symptoms (e.g., substance use, aggression), whereas the high F2 group scores higher on anxiety, substance abuse, and aggression, which is consistent with previous research. Indeed, both Skeem et al. (2007) and Hicks et al. (2004) identified one group with high F1 traits, low anxiety, low impulsivity and aggressiveness, and a second group with high F2 traits and high borderline features, irritability and emotion dysregulation. These findings suggest that F2 plays a significant role in relation to higher levels of psychopathology and maladaptive behaviors, whereas F1 seems to play less of a role as indicated by low associations with psychopathology (e.g. anxiety), impulsivity and aggression. The lack of consistency in classes across these studies may be due to variability in the populations studied (e.g., inmates versus substance users); differing gender proportions; and differences in the measurement of F1. As such, there is a need to extend previous work using a large, mixed gender sample that includes PPI and PCL-R measures of F1 and utilizes complementary regression-based and person-centered approaches.

Current Study

The aims of the current study were to test if F1 exerts potentiating or protective effects on the relation between F2 and psychopathology and maladaptive behaviors in a large (N > 1,500), mixed gender sample of substance users and prisoners. Furthermore, given the divergent conceptualizations of F1 across the PCL-R and PPI, we also examined if the measurement of F1 influences protective or potentiating effects by comparing the strength of the effects of F1 across measures. In exploring the interaction of F1 and F2, we utilized two complementary approaches to testing the directionality of the interaction effects– the classic regression-based approach as well as an empirically derived "person-centered" approach. This two-pronged analytic method allowed for the examination of consistency of interactive

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effects from two approaches that rely on the same data, but organize the variables in different ways. Moreover, the "person-centered" approach is broadly consistent with longstanding historical approaches to the subtyping of psychopathy, such as those of Karpman and other numerous cluster analyses of psychopathy focused on potential subtypes (e.g. primary and secondary psychopathy; Karpman, 1941; Hicks, et al., 2004; Skeem et al., 2007). Finally, given that previous work indicates that the potentiating effects of F1 may only be present among females, we also tested if the effect (in either direction) is gender-specific.

Method

Participants, Setting, and Procedure

The sample came from a de-identified dataset of 1,534 offenders who were court-ordered to community-based or prison-based residential drug treatment programs or were serving prison sentences in Oregon, Utah, Nevada, and Florida[1]. Participants were also recruited from a residential drug treatment program (located within a prison) in Texas. There were 727 individuals from community drug treatment programs (47.4% of the sample) and 807 from prison sites (53.6% of the sample). Overall, participants were primarily male (83.3%) and Caucasian (65.8%). A third (29.6%) had not completed high school, 43.2% had graduated high school or received a GED, and 26.7% had at least some college. The procedure was as follows: participants were given a detailed explanation of the procedures, asked to provide written informed consent, and completed a number of self-report questionnaires and interviews.

Measures

Demographic information—Information was obtained regarding gender, race, education, and data collection site (e.g. substance abuse facility versus prison).

Psychopathy—Two measures of psychopathy were administered to participants: the PCL-R (Hare, 1991) and the PPI (Lilienfeld & Andrews, 1996). Both measures were divided into F1 and F2 scores in the analyses.

PCL-R total scores range from 0-40, with 30 as the standard cut-off score for determining the degree to which an individual meets criteria for psychopathy. PCL-R scores have demonstrated high inter-rater reliability, with intraclass correlations ranging from .87 to .95 (Hare, 1991; Vitale & Newman, 2001), as well as good internal consistency (alphas ranging from .83-.91) and convincing construct validity (Hare, 1990; Vitale & Newman, 2001). In the current study, the reliability data were as follows: Total score, $\alpha = .82$, F1, $\alpha = .81$, F2, $\alpha = .68$ and an inter-rater reliability of .88.

The PPI is a self-report measure containing 187 items answered with a 4-point Likert scale. PPI scores have demonstrated high internal consistency (alphas ranging from .89-.93), high

[1]This study uses a subset of data collected as part of a grant exploring personality features in social deviancy from the National Institute of Mental Health. Previous work describes the data collection process, other uses of the data, and other variables collected in the dataset (Poythress, Lilienfeld, Skeem, Douglas, Edens, Epstein & Patrick, 2010; Poythress, Edens, Skeem, Lilienfeld, Douglas, Frick, Patrick, Epstein, & Wang 2010).

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test-retest reliability (.82-.95) (Lilienfeld & Andrews, 1996), as well as strong construct validity (Patrick et al., 2006). Here, the reliability data were as follows: Total score, α = .91, PPI-I alphas ranged from .80-.86 across subscales and PPI-II alphas ranged from .73-.89 across subscales.[2]

Comorbid psychopathology, childhood abuse and arrests—Scores from several scales of the *Personality Assessment Inventory* (PAI; Morey, 1991) were used to measure comorbid psychopathology and substance use. We used scales that are non-overlapping and comorbid with psychopathy F1 and F2. The borderline features scale (BOR) was used to assess the presence of BPD features and scores from this scale have demonstrated good internal consistency (alpha=.84), test-retest reliability (.73) and construct validity (Morey, 1991). Furthermore, the BOR scale is highly correlated (r = .58) with the Structured Clinical Interview for DSM-IV Axis II Disorders (Jacobo, Blais, Baity, & Harley, 2007). The Depression (DEP) scale was used as a measure of depression and the Anxiety (ANX) scale was used as a measure of anxiety. Scores from these scales have demonstrated good internal consistency in the clinical standardization sample of the PAI (alpha of ≥ .93 for both scales). The Alcohol (ALC) and Drug Scales (DRG) were used as measures of substance abuse. Scores from these scales have demonstrated good internal consistency in the clinical standardization sample of the PAI (alphas of ≥ .80 for both scales, Morey, 1991). Scores from the PAI Suicide Scale (SUI) were used to index suicidality and self-harm, which have demonstrated good internal consistency. Alphas for the PAI scales in the present sample ranged from .79-.94.

Childhood abuse history was assessed using the *Child Abuse and Trauma Scale* (CATS; Sanders & Giolas, 1991), which is a 38-item self-report measure of physical abuse or punishment, sexual abuse, verbal or psychological abuse, neglect, and a negative home environment. CATS scores have shown high internal consistency and test-retest reliability (Sanders & Becker-Lausen, 1995), with an alpha of .95 for the current study. Finally, as a measure of criminal behavior, state and federal records were searched to obtain arrest records of participants who were released into the community after protocol completion. Dichotomous variables (yes/no) were created to indicate whether each participant had been arrested for any kind of offense within a one year period following either enrollment into the drug treatment program or release from prison into the community.

Results

Regression–Based Approach

A series of linear and logistic regressions for the PCL-R and PPI were conducted separately with F1, F2 and their interaction to examine independent and interactive effects of each factor and gender in predicting psychopathology, childhood abuse, and re-arrest. Correlations between psychopathy factors and outcome variables are shown in Table 1. Covariates (gender, education, race, site), F1 and F2 were entered into the first step, followed by the F1xF2 interaction in the second step, and the 2-way interaction of each

[2]It should be noted that the Coldheartedness factor of the PPI was not used because it does not align with the parallel comparison of the two psychopathy measures and the exploration of the interactive nature of the psychopathy factors across external correlates.

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factor with gender (F1xgender, F2xgender) as well as the three-way interaction of F1xF2xgender in the third step.

For the PCL-R, there were main effects for F1 and F2, with F1 exhibiting a negative relation and F2 exhibiting a positive relation with psychopathology (see Table 2). Notably, however, PCL-R F1 only showed significant associations with anxiety, depression, drug use, alcohol use, and childhood abuse. The F1xF2 and the F1xF2xgender interaction were not significant, suggesting no effect of F1 and no gender differences. For the PPI, there were main effects for F1 and F2, with F1 exhibiting a negative relation and F2 exhibiting a positive relation with psychopathology and childhood abuse (see Table 2). The F1xF2 interaction was significant for depression and suicide ($B = -.09$ and $B = -.07$ respectively, ps $< .01$). Further examination of the interaction effects showed a protective effect of F1. Furthermore, the three-way interaction of F1xF2xgender was significant for suicide ($B = -.17$, $p < .01$), such that the interaction was significant for men, but not women.[3] Finally, unstandardized beta weights and standard errors from the interaction terms of the PCL-R and PPI were transformed to z-values and compared using a critical value table to determine if differences existed across measurement method. A critical value of +/− 2.58 was used for $p < .01$, a conservative significance level to control for Type I error. A significant difference emerged for depression ($z = 4.29$) and suicide ($z = 2.70$), but not for BPD ($z = -.72$), anxiety, ($z = 2.29$), drug use ($z = .84$), alcohol use ($z = .36$), childhood abuse ($z = -1.79$) and re-arrest ($z = -.37$). Thus, there is little evidence for a significant difference across measures, although the PPI demonstrated stronger relations with psychopathology.

Latent Profile Analysis[4]

Two series of latent profile models were fit to F1 and F2 PCL-R and PPI scores separately via Mplus version 6.1 (Muthen & Muthen, 2006), obtaining one through five class solutions. A latent profile analysis was chosen as opposed to a latent class analysis because it is more appropriate due to the continuous nature of the variables. The estimation of each model was run with 1500 random sets of start values and 500 final stage optimizations to help ensure that the resulting estimates are based on global rather than local maxima of the likelihood. Model selection was based on interpretability of parameter estimates and comparative data-model fit in terms of information criteria and hypothesis tests. For each model, the Akaike Information Criterion (AIC), sample-size-adjusted Bayesian information criterion (SS–BIC; Sclove, 1987), relative entropy, and Lo-Mendell Rubin test (LMR) were obtained; they are preferred criteria for selecting the number of classes to retain for latent profile models of data structures (Henson et al., 2007; Jung & Wickrama, 2008). The AIC and SS-BIC are based on the log-likelihood of a model with penalty terms that account for model complexity. Relative entropy measures the uncertainty of classification of subjects into the latent class. Values can range from 0 to 1, with values closer to 1 indicating an adequate level of classification accuracy between observed and predicted class membership. The LMR test compares the model under examination (K) with a model with one less class

[3]The full regression models are not included due to space limitations and are available as supplemental materials.
[4]Classes were also derived using median splits on F1 and F2 scores for the PCL-R and PPI and subsequent analyses were performed. Although the distribution of individuals across classes was more equal, the results of the interactive effects, gender differences and measurement differences told the same story as the current findings.

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(K-1). Non-significant values indicate that the number of classes within the model under examination does not display better fit than a model with one less class (Jung & Wickrama, 2008). As such, the best fitting model will have smaller AIC and SS-BIC values, higher entropy values and a significant Lo-Mendell Rubin test. Fit indices were used in conjunction with theory to guide model selection because the best fitting model should not only be statistically significant, but also interpretable, providing a clear and sensible explanation of the data.

Table 3 contains the overall fit statistics for the latent profile analysis. A four-class model was identified as the best fitting model for both the PCL-R and PPI. For the PCL-R, the four-class model stood out as the best fit across most fit indices. Although the five-class model had a lower AIC value, all other indices worsened for the five-class model, suggesting that the four-class model best fit the data. Furthermore, a four-class model provided the best interpretation of classes based on psychopathy factors. Results for the PPI were slightly different, as the three-class model had a lower SS-BIC value and the five-class model had a lower AIC value and slightly higher entropy relative to other class solutions. However, the three-class and five-class models had non-significant LMR statistics and were not as interpretable; the other fit indices pointed to the four-class model as the best fitting.

The four classes varied according to the combination of F1 and F2 scores: Class 1 (low F1-low F2); Class 2 (low F1-high F2); Class 3 (high F1-low F2); and Class (high F1-high F2). Class membership for the PCL-R and PPI are presented in Table 2. Using the PCL-R, most individuals fell in the low F1-high F2 class, whereas using the PPI most fell into the low F1-low F2 class. However, while the distribution of individuals across classes varied, the PCL-R and PPI formed similar classes based on F1 and F2 scores. Classes were consistent across gender as well.[5] Furthermore, the average conditional probabilities (all > .70) showed that there was a good fit between each class and to which class individuals were assigned (Table 4).

Next, the best-fitting four-class models of the PCL-R and PPI were used to test whether F1 exerted a protective or potentiating effect on F2 in relation to psychopathology, childhood abuse, and arrests. A series of analyses of covariance (ANCOVA) were conducted for continuous variables (e.g., BPD, anxiety, depression, drug use, alcohol use, suicide, and childhood abuse) and chi-square analyses were used to examine differences across classes for categorical variables (e.g., gender, race, education, and arrest). To control for Type I error rate, a significance level of .01 was used for each ANCOVA and chi-square analysis.

Differences Across Classes

PCL-R—As shown in Table 5, participants in the four classes were compared on several demographic characteristics. Chi-square analyses showed significant associations between class and gender, $X^2(3) = 82.32$, $p < .001$; race $\chi^2(3) = 40.86$, $p < .001$; education $\chi^2(6) = 39.56$, $p < .001$; and site $\chi^2(3) = 52.09$, $p < .001$. Given that all demographic variables revealed significant differences, they were included as covariates in subsequent analyses. A

[5]This information was not included in the tables due to the focus of the paper on assessment and space limitations, but is available as supplemental materials.

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series of univariate ANCOVAs were conducted to determine if psychopathology, childhood abuse, or re-arrests differed across the four classes. There was a significant effect of class for BPD [$F(3) = 29.62$, $p < .001$, Cohen's $d = .50$], anxiety [$F(3) = 6.90$, $p < .01$, $d = .24$] depression [$F(3) = 5.64$, $p < .01$, $d = .22$], drug use [$F(3) = 21.14$, $p < .001$, $d = .42$], alcohol use [$F(3) = 3.76$, $p < .05$, $d = .18$], suicide [$F(3) = 6.73$, $p < .001$, $d = .24$] and childhood abuse [$F(3) = 16.47$, $p < .001$, $d = .38$]. As shown in Figures 1.1-1.7, both high F2 classes exhibited higher levels of BPD, anxiety, depression, drug and alcohol use, suicide and childhood abuse than both low F2 classes. Chi-square analyses showed significant differences between class and re-arrest [$\chi^2(3) = 14.02$, $p < .01$, $d = .24$], and those in the both high F2 classes were more likely to have been re-arrested than those in both low F2 classes.

To determine the presence of potentiating or protective effects of F1, the critical comparison lies between the high F2 classes with high versus low F1 to isolate the effects of F1 on high levels of F2. Post-hoc comparisons (Figures 1.1-1.7) indicated that the low F1-high F2 and high F1-high F2 classes were significantly different for levels of anxiety, but not other types of psychopathology. The low F1-high F2 class had higher levels of anxiety than the high F1-high F2 class, suggesting a potential protective effect of F1.[6] A second series of ANCOVAs were conducted to determine the presence of gender differences. There was no overall effect of gender on the associations across all four classes with external variables: BPD [$F(3) = .18$, $p = .913$, $d = 0$], anxiety [$F(3) = .77$, $p = .510$, $d = .09$], depression [$F(3) = 1.2$, $p = .320$, $d = .09$], drug use [$F(3) = .17$, $p = .920$, $d = 0$], alcohol use [$F(3) = .25$, $p = .247$, $d = .06$], suicide [$F(3) = 1.41$, $p = .238$, $d = .11$], childhood abuse [$F(3) = 1.58$, p = .193, $d = .11$] and re-arrest [Wald's $X^2(1) = 3.42$, p = .064, Exp(B) = 1.37 (.98-1.9)]. Additionally, comparisons of the low F1-high F2 and high F1-high F2 classes revealed no significant effect of gender for: BPD [$F(1) = .02$, $p = .877$, $d = 0$], anxiety [$F(1) = .31$, $p = .575$, $d = 0$], depression $F(1) = .10$, $p = .758$, $d = 0$], drug use [$F(1) = .22$, $p = .641$, $d = 0$], alcohol use [$F(1) = .14$, $p = .708$, $d = 0$], suicide [$F(1) = .79$, $p = .373$, $d = .06$], childhood abuse [$F(1) = .43$, $p = .511$, $d = 0$] and re-arrest [Wald's $X^2(1) = 2.43$, $p = .119$, Exp(B) = 1.47 (.91-2.39)].

PPI—As shown in Table 5, participants in the four classes were compared on several demographic characteristics. Chi-square analyses showed significant differences between class and gender, $\chi^2(3) = 12.09$, $p < .01$; race $\chi^2(3) = 13.14$, $p < .01$; education $\chi^2(6) = 39.91$, $p < .001$; and site $\chi^2(3) = 36.77$, $p < .001$. All demographic variables were included as covariates in subsequent analyses since they differed significantly across classes[7]. A series of univariate ANCOVAs were conducted to determine if psychopathology, childhood abuse, or re-arrests differed across the four classes. There was a significant effect of class for BPD [$F(3) = 187.66$, $p < .001$, $d = 1.25$], anxiety [$F(3) = 89.74$, $p < .001$, $d = .86$], depression [$F(3) = 105.22$, $p < .001$, $d = .93$], drug use [$F(3) = 44.29$, $p < .001$, $d = .61$], alcohol use [$F(3) = 10.16$, $p < .001$, $d = .29$], suicide [$F(3) = 44.61$, $p < .001$, $d = .61$], and childhood

[6]Individual post-hoc comparisons across all possible class comparisons are not included due to space limitations and are available as supplemental materials.

[7]To ensure that including education as a covariate was not controlling for traits associated with PPI-I (e.g. fearless dominance) the analyses were re-run without education as a covariate and results showed no change in the effects that emerged – however in most cases, the PCL-R effects were weaker and the PPI effects were stronger.

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abuse [$F(3) = 34.26$, $p < .001$, $d = .54$]. As shown in Figures 1.1-1.7, both high F2 classes had higher levels of BPD, anxiety, depression, drug use, alcohol use, suicide and childhood abuse than both low F2 classes. Chi-square analyses showed no significant difference between classes on re-arrest [$\chi^2(3) = .127$, $p = .99$, $d = .02$].

The low F1-high F2 and high F1-high F2 classes were compared to determine potentiating or protective effects of F1, because these classes allow for isolation of the effects of F1 on high levels of F2. Post-hoc comparisons (Figures 1.1-1.7) indicated that the low F1-high F2 and high F1-high F2 classes were significantly different for levels of anxiety and depression, but not other types of psychopathology. The low F1-high F2 class had higher levels of anxiety and depression than the high F1-high F2 class, suggesting a potential protective effect of F1.[1] A second series of ANCOVAs was conducted to determine the presence of gender differences. There was a significant overall effect of gender on suicide across the four classes [$F(3) = 4.49$, $p < .01$, $d = .19$], but not for BPD [$F(3) = 1.35$, $p = .257$, $d = .11$], anxiety [$F(3) = .32$, $p = .813$, $d = .06$], depression [$F(3) = .81$, $p = .490$, $d = .09$], drug use [$F(3) = .89$, $p = .448$, $d = .09$], alcohol use [$F(3) = 2.57$, $p = .053$, $d = .14$], childhood abuse [$F(3) = 1.58$, $p = .193$, $d = .11$] and re-arrest [Wald's $X^2(1) = 1.55$, $p = .213$, Exp(B) = 1.29 (.87-1.9)]. Comparisons of the two high F2 classes revealed no significant effect of gender for: BPD [$F(1) = .17$, $p = .684$, $d = .09$], anxiety [$F(1) = .33$, $p = .567$, $d = .14$], depression [$F(1) = .30$, $p = .587$, $d = .13$], drug use [$F(1) = 1.12$, $p = .293$, d = .25], alcohol use [$F(1) = 1.33$, $p = .254$, $d = .27$], suicide [$F(1) = 5.43$, $p = .023$, $d = .54$], childhood abuse [$F(1) = 2.99$, $p = .088$, d = .41], and re-arrest [Wald's $X^2(1) = .07$, $p = .797$, Exp(B) = 1.22 (.26-5.7)].[2]

Differences Across Measurement

To determine if the measurement of F1 impacted associations between F2 and psychopathology, a formal comparison of regression weights was used. In this approach, the low F1-high F2 and high F1-high F2 classes from the PCL-R were selected and regressed onto psychopathology. This same procedure was repeated for the PPI classes. The unstandardized beta weights and standard errors from the PCL-R regressions and from the PPI regressions were compared using a critical value table. Critical z values of +/− 2.58 are used for $p < .01$. Results indicated a significant difference for depression (z = 3.35), such that PPI-I exerted a stronger protective effect than PCL-R F1. However, there were no significant differences for BPD (z = .89), anxiety (z = 2.39), drug use (z = .90), alcohol use (z = .99), suicide (z = 1.07), childhood abuse (z = −.19), or re-arrest (z = .02).[8] Thus, PCL-R F1 and PPI-I exerted same effect on F2 in relation to childhood abuse, psychopathology, and re-arrest; however PPI-I evidenced stronger effects with these outcomes.

Discussion

The purpose of the current study was to examine (1) whether F1 of psychopathy interacts statistically with F2 to affect its relation (i.e., protective or potentiating effect) with psychopathology and other maladaptive behaviors, (2) whether the protective or potentiating

[8]The z-values for every possible combination of class comparisons are not included due to space limitations and are available as supplemental materials.

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effect if present, is gender-specific, (3) whether the measurement of F1 influences the nature of the effect, and (4) the consistency of the interaction effects through the use of both a regression-based and a person centered approach. Findings indicated a four-class solution as the best fitting model for both the PCL-R and PPI, with classes consisting of low F1-low F2, low F1-high F2, high F1-low F2 and high F1-high F2. The PCL-R and PPI classes with high F2 (low F1-high F2 and high F1-high F2) scored higher on measures of BPD, anxiety, depression, drug use, alcohol use, suicide, childhood abuse and re-arrests than the classes with low F2 scores. F2 also showed strong positive associations with each outcome, whereas F1 had a negative association (in the case of the PPI) or no association (in the case of the PCL-R).

Potentiating v. Protective Effects

Across analytic methods, there were few cases for which the level of F1 influenced the association of F2 and psychopathology, childhood abuse, and re-arrest in either a protective or potentiating direction. There were several exceptions: a protective effect of F1 was found for anxiety for PCL-R and anxiety, depression and suicide for the PPI, meaning that for individuals scoring high on Factor 2 across measures, the risk for these maladaptive outcomes was lower when they also scored high on Factor 1. Nevertheless, we are unsure how much credence to accord to these findings since in all other cases, F1 did not have a protective or potentiating effect; these effects stand in contrast to findings supporting potentiating effects (Coid et al., 1993; Sprague et al., 2012; Verona et al., 2012). Our contrasting findings may be due to the fact that we controlled for covariates in our regression analysis, used latent profile analysis and had a small number of individuals in critical class comparisons. Furthermore, we used the PPI in isolation, whereas previous studies exploring potentiating effects used a combined score of the PPI with another psychopathy measure and used a screening version of the PCL-R as opposed to the original measure. Despite these differences, it is likely that F2 is driving the relationship between measures of psychopathy and psychopathology and other maladaptive outcomes, with a limited role, if any, for F1, which is consistent with other studies finding that F2 alone exhibits a stronger association and is a better predictor than F1 or their combined effect in relation to psychopathology and other external correlates (e.g. recidivism, violence; Kennealy et al., 2010; Walters & Duncan, 2005).

Measurement

Across measurement methods, several notable findings emerged. First, the PCL-R and the PPI appear to still be functioning in similar ways in relation to psychopathology and other maladaptive behaviors. This conclusion is further qualified by formal comparisons showing that significant differences did not emerge between measures in the majority of cases. This study is the first to show that there are minimal differences between PCL-R and PPI in their external correlates, despite previous concerns regarding their divergent conceptualizations of F1.

Although there was little difference between the two measures in their correlates, the LPA models were different in the sample size composition, and the PPI exhibited stronger associations with childhood abuse, psychopathology, and re-arrest. For instance, depression

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and suicide were the only outcomes in which differences were present and where a protective effect emerged for the PPI. Although the issue of method variance cannot be ruled out, these results are consistent with the nature of PCL-R F1 versus the PPI-I (Benning et al., 2003; Skeem et al., 2007; Warren et al., 2003), and argues against the parallel nature of the two measures, at least in respect to their conceptualization of F1. That is, PPI-I, which represents fearless dominance, is a largely adaptive trait that consistently shows negative correlations with distress-related psychopathology (Benning et al., 2003; Patrick et al., 2006).

Therefore, in this context, F1 may serve as a protective factor against some forms of psychological disturbance. This result is consistent with the fact that only 3% of the sample was found to be high F1 - low F2 on the PPI. In general, we would expect people in this group to be less prone than other people to being incarcerated. Further support comes from the fact that individuals with high F1 in this sample were more likely to have higher education levels. In contrast, PCL-R F1, largely comprising a lack of empathy, callousness, and grandiosity, is more maladaptive and is often uncorrelated or only weakly correlated with psychopathology (Warren et al., 2003). The potential protective role of PPI-I may bear important implications for treatment approaches, especially among a population consistently linked with poor treatment response due to traits traditionally associated with F1 (e.g., callousness, lack of empathy) (see Salekin et al., 2010 for review). As such, an important distinction may be the adaptive value of traits associated with PPI-I and their relation to risk of psychopathology and other maladaptive behaviors associated with F2.

On a broader note, the findings of the current study bring in the issue of the utility of F1 in conceptualizing psychopathy, given increasing evidence for its limited clinical relevance. Indeed, a combination of F1 and F2 traits are typically used to identify psychopathy, as evidenced by the use of a total score on measures of psychopathy. However, F1 consistently shows a lack of association with external correlates and fails to add any incremental value to F2, which is already well captured by ASPD, in the case of the PCL-R (Kennealy et al., 2010; Walters & Duncan, 2005). Thus, it raises the question of whether or not F1 is psychopathological in nature or should be considered as a component of psychopathy. Furthermore, PPI-I, tends to show stronger associations with correlates considered to be orthogonal to psychopathy (e.g. psychological distress) as opposed to those that are presumed central to psychopathy (e.g. aggression, empathy, antisocial behavior) which are in contrast to those evidenced by the PCL-R and other measures of psychopathy (Blonigen et al., 2010; Marcus, Fulton & Edens, 2013; Miller & Lynam, 2012). Differential associations are also true for dimensions of personality, as PPI-I tends to be negatively correlated with Neuroticism, positively associated with Extraversion and uncorrelated with Agreeableness, whereas PCL-R F1 shows null to weak correlations with negative and positive emotionality and is negatively correlated with Agreeableness (Miller & Lynam, 2012). And, the degree of overlap between F1 and F2 varies significantly depending on the conceptualization and measure used. Specifically, the PCL-R factors are typically correlated whereas the PPI factors are not correlated, making it unclear what the two factors share and highlighting the continued controversy of the utility of F1 in conceptualizations of psychopathy. Furthermore, PPI-I subscales often cross-load onto PPI-II, raising questions about the optimal factor solution (Neumann et al., 2008).

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Strengths, Limitations and Future Directions

The current study was marked by several strengths. The first was the comparison of two analytic approaches to examining interactive effects. Although both approaches have been used to explore psychopathy, they have not been used in tandem, nor has latent profile analysis been used to explore the statistical influence of F1 on associations for F2. Additionally, this is one of the first studies to examine F1 in particular and its effect on F2 across measurement methods, placing careful emphasis on exploring differences in measurement between the PCL-R and PPI. Third, the sample included both men and women to explore potential gender differences in interactive effects.

Despite these strengths, there were several limitations. The sample was fairly homogeneous, as it was composed primarily of Caucasian male offenders and should be replicated in more diverse samples. Second, the sample comprised a relatively small proportion – albeit a large number (> 250) – of females compared with males. Third, several of the groups had a small amount of individuals, which may have affected our ability to detect interactions. Fourth, the slightly stronger effects for the PPI (and the protective effects that emerged) may have been due to method variance, as the PAI and PPI are both self-report measures. However, potential effects of method variance are contrasted by the fact that overall, the findings were consistent across measure, with theories of psychopathy, and with findings from previous research. Fourth, although the two factor structure of psychopathy has empirical support, there is continued debate concerning the factor structure of psychopathy. For instance, alternative three-facet (Cooke & Michie, 2001) and four-facet models of psychopathy (Neumann *et al.* 2013) have been proposed. In further work in large samples, it may be helpful to examine statistical interactions among these facets in exploratory analyses, although doing so in this sample (e.g., by comparing all pair-wise combinations or facets or all facets in conjunction) would have risked substantial increases in Type I error given the enormous number of analyses.

Indeed, analyses using a different factor structure/conceptualization might produce different results. For instance, the three-facet model parses traits associated with F1 and validation studies have shown that the Deficient Affective factor (Factor 2 in the three-facet model) correlates with criminal behavior and social detachment, whereas the interpersonal characteristics (Arrogant Deceitful Interpersonal Style factor) are associated with indices of adaptive functioning (e.g. positive emotionality, low stress reactivity) that are more closely related to a potential protective role (Cooke & Michie, 2001; Hall, Benning, & Patrick, 2004). Thus, the lack of association in the current study for F1 may be due to the fact that the two factor model groups all F1 traits together, muddling the effects of the more fine-grained parsing. As such, choosing the two factor model of psychopathy in this case may have resulted in Type II error. However, it is also possible that the deficient affective component of F1 (Deficient Affective factor of three-facet model) is questionable in terms of its utility in conceptualizing psychopathy given limited clinical relevance in this model as well as the two factor model.

Future directions may include the examination of other components of F1 that may statistically influence F2. For instance, it may be worthwhile to examine if the

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"coldheartedness" component of the PPI (which indexes lack of sentimentality, lack of reactivity to others' distress, and lack of guilt and empathy), or the allied notion of "meanness", which includes arrogance, aggressive competitiveness, and predatory aggression, and has recently been proposed to be a part of psychopathy (Patrick, Fowles, & Krueger, 2009) exert protective or potentiating effects on psychopathology. Furthermore, examination of the other models of psychopathy (e.g. three and four-facet models) may help to further parse the construct of psychopathy and inform the role of F1 traits in associations with external correlates. Next, exploration of other well-validated self-report psychopathy measures may provide further insights into potentiating or protective effects across varying conceptualizations of psychopathy. Finally, F1 and F2 appear to be heterogeneous combinations of traits drawn from extant models of normal personality, such as the influential five factor model. In particular, PCL-R F1 largely reflects low agreeableness, whereas PPI-I reflects low neuroticism/negative emotionality. For example, in a review of the literature, Lilienfeld, Smith, Watts, Berg, and Latzman (in press) found that PPI-I, reflecting fearless dominance or boldness, was strongly negatively associated with neuroticism from the perspective of the Big Five model of personality and negative emotionality from the perspective of the Big Three model of personality. In contrast, F2 of both measures largely reflects low agreeableness and low conscientiousness, with a modest contribution from high neuroticism/negative emotionality (Lynam & Derefinko, 2006). It is possible that statistical interactions could emerge at the level of these ostensibly more homogeneous dimensions. Answers to these and other unresearched questions have the potential to inform prevention and intervention efforts for a particularly difficult and severe population.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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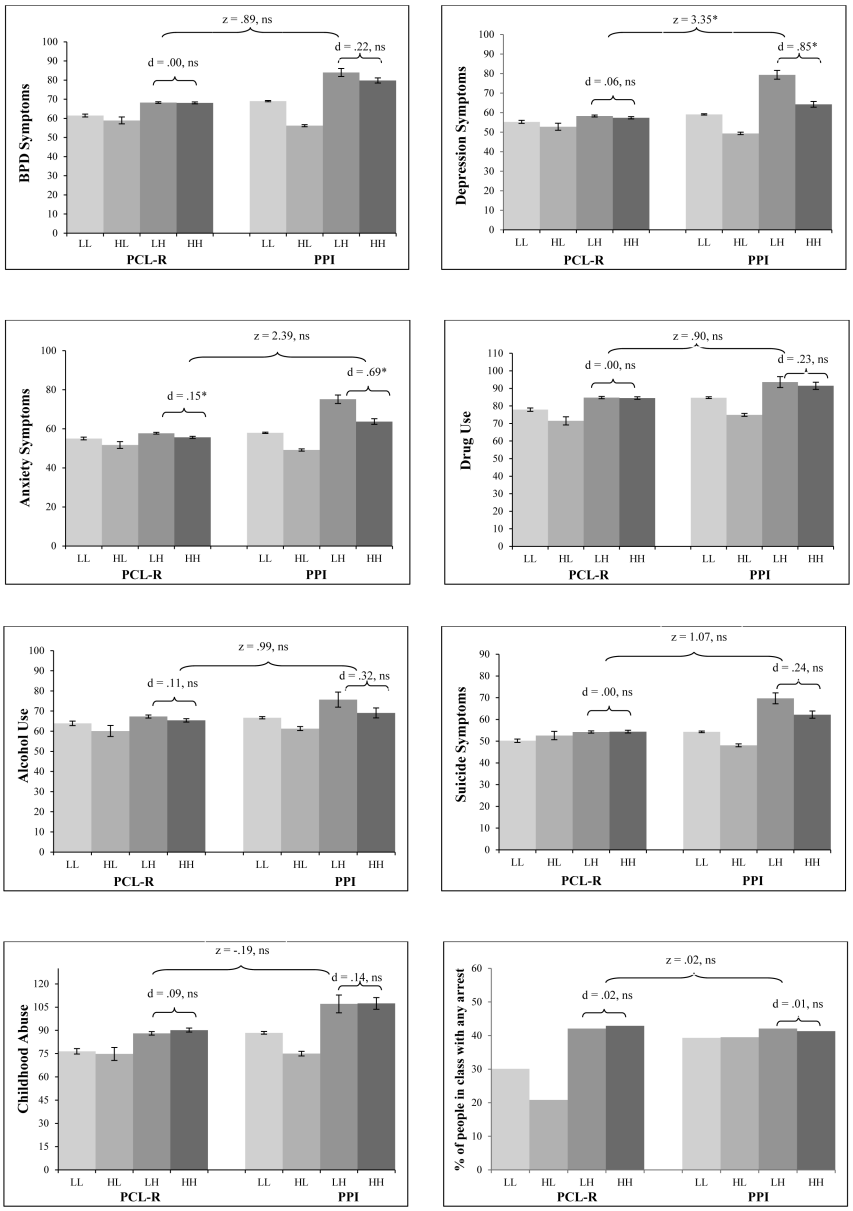

Figures 1.1-1.7.

Psychopathy Checklist-Revised (PCL-R) and Psychopathic Personality Inventory (PPI) with mean levels of BPD, anxiety, depression, drug use, alcohol use, suicide, childhood abuse, and percent of people with any arrest one year post-release. Cohen's *d* is shown for individual contrasts between classes with high Factor 2. The critical *z* –value is also shown for measurement contrasts between classes with high Factor 2. Abbreviations are as follows: LL, Low F1-Low F2; HL, High F1-Low F2; LH, Low F1-High F2; HH, High F1-High F2.

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Table 1

Correlations between Psychopathy Factors and External Correlates

Variable	1	2	3	4	5	6	7	8	9	10	11	12
PCL-R F-1	--	0.50*	0.25*	0.18*	−0.00	−0.12*	−0.06	−0.12*	−0.08*	0.00	0.02	0.08
PCL-R F2		--	0.16*	0.40*	0.25*	0.06	0.11*	0.15*	0.07*	0.13*	0.24**	0.15*
PPI-I			--	−0.07	−0.29*	−0.47*	−0.44*	−0.12*	−0.14*	−0.21*	−0.11**	0.06
PPI-II				--	0.66*	0.47*	0.50*	0.39*	0.20*	0.37*	0.32**	−0.02
BPD					--	0.74*	0.72*	0.52*	0.31*	0.54*	0.44**	0.00
Anxiety						--	0.78*	0.25*	0.37*	0.51*	0.35**	−0.04
Depression							--	0.34*	0.19*	0.62*	0.34**	−0.04
Alcohol Use								--	0.43*	0.19*	0.13**	−0.07
Drug Use									--	0.29*	0.23**	−0.05
Suicide										--	0.33**	−0.01
Trauma											--	0.01
Re-arrest												--

Note. PCL-R = Psychopathy Checklist-Revised; PPI = Psychopathic Personality Inventory; BPD = Borderline Personality Disorder.

*$p < .01$

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Table 2

Regression Analysis of PCL-R and PPI Factors and Gender in Predicting Psychopathology and Maladaptive Outcomes

Model	BPD	Anxiety	Depression	Drug Use	Alcohol	Suicide	Abuse	Arrest
PCL-R								
Step 1								
Gender	−0.17*	−0.16*	−0.13*	−0.12*	0.05	−0.08*	−0.19*	0.21 (0.19)
Education	−0.04	−0.07	−0.03	0.04	0.07*	0.04	0.06	−0.20 (0.09)
Race	0.06	0.04	0.06	0.26*	0.06	0.07*	0.10*	−0.62 (0.15)*
Site	0.23*	0.18*	0.12*	0.41*	0.25*	0.10*	0.02	−0.11 (0.15)
F1	−0.07	−0.11*	−0.08*	−0.10*	−0.11*	−0.04	−0.09*	−0.01 (0.02)
F2	0.33*	0.15*	0.17*	0.28*	0.16*	0.18*	0.33*	0.06 (0.02)*
Step 2								
F1×F2	−0.28	−0.23	−0.19	−0.13	−0.11	−0.17	−0.18	−0.01 (0.00)
Step 3								
F1×F2×Gender	0.31	0.42	0.58	0.13	0.25	0.47	0.25	0.01 (0.01)
PPI								
Step 1								
Gender	−0.11*	−0.11*	−0.07*	−0.09*	0.07*	−0.04	−0.15*	0.23 (0.18)
Education	0.00	−0.01	0.03	0.03	0.06	0.07*	0.04	−0.27 (0.09)*
Race	0.02	0.03	0.04	0.24*	0.07*	0.05	0.08*	−0.61 (0.15)*
Site	0.10*	0.09*	0.01	0.36*	0.23*	0.03	−0.06	−0.12 (0.14)
F1	−0.21*	−0.42*	−0.39*	−0.05	−0.13*	−0.18*	−0.07*	0.17 (0.10)
F2	0.63*	0.42*	0.48*	0.30*	0.15*	0.36*	0.33*	−0.03 (0.09)
Step 2								
F1×F2	0.01	−0.05	−0.09*	−0.02	−0.01	−0.07*	0.04	0.04 (0.12)
Step 3								
F1×F2×Gender	0.05	−0.06	−0.02	−0.07	−0.08	−0.17*	−0.08	0.14 (0.37)

Note. Cell values for psychopathology variables and abuse represent standardized linear regression weights and cell values for arrest represent unstandardized logistic regression weights and standard errors; PCL-R = Psychopathy Checklist-Revised; PPI = Psychopathic Personality Inventory; BPD = Borderline Personality Disorder; F1 = Factor 1, F2 = Factor 2.

* $p < .01$.

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Table 3

Fit Results for Latent Profile Analysis for PCL-R and PPI

	1 class	2 class	3 class	4 class	5 class
PCL-R					
AIC	8227.33	7794.27	7671.18	7637.29	7632.56
SS-BIC	8235.75	7809.00	7692.23	7664.66	7666.24
Entropy	--	0.66	0.68	0.72	0.64
LMR	--	419.84 (p = .00)	123.44 (p = .00)	38.14 (p = .00)	10.26 (p = .21)
PPI					
AIC	8386.25	8383.20	8378.34	8374.44	8371.33
SS-BIC	8394.74	8398.05	8399.55	8402.02	8405.27
Entropy	--	0.27	0.60	0.66	0.67
LMR	--	8.65 (p = .04)	10.39 (p = .26)	9.46 (p = .02)	8.72 (p = .09)

Note. PCL-R = Psychopathy Checklist-Revised; PPI = Psychopathic Personality Inventory; AIC = Akaike Information Criterion; SS-BIC = sample size adjusted BIC; LMR = Lo-Mendell Rubin likelihood ratio test.

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Table 4

Class Membership for PCL-R and PPI

	N(%)	M(SD)			CP
		Low F1-Low F2			
		F1	F2	Total Score	
PCL-R	283 (19.5)	3.22 (.12)	6.93 (.14)	11.49 (.21)	0.86
PPI	1038 (70.3)	−.05 (.02)	.21 (.01)	.21 (.71)	0.73
		Low F1-High F2			
		F1	F2	Total Score	
PCL-R	618 (42.5)	6.54 (.08)	12.94 (.10)	21.56 (.14)	0.81
PPI	25 (1.7)	−1.33 (.09)	1.33 (.06)	.42 (.62)	0.79
		High F1-Low F2			
		F1	F2	Total Score	
PCL-R	46 (3.2)	11.61 (.29)	6.78 (.27)	20.24 (.50)	0.72
PPI	356 (24.1)	.15 (.04)	−.99 (.02)	−1.02 (.75)	0.82
		High F1-High F2			
PCL-R	506 (34.8)	12.56 (.08)	15.14 (.11)	30.14 (.16)	0.88
PPI	58 (3.9)	.57 (.08)	1.56 (.04)	2.28 (.53)	0.81

Note. PCL-R = Psychopathy Checklist-Revised; PPI = Psychopathic Personality Inventory; F1 = Factor 1; F2 = Factor 2; CP = conditional probabilities.

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Table 5

Demographic Variables and Group Differences Between Classes for the PCL-R and PPI

PCL-R	Low F1 Low F2	Low F1 High F2	High F1 Low F2	High F1 High F2	Statistics
Gender (% Male)	67.8	84.6	91.3	92.1	χ^2 (3) = 82.32, p < .001
Race (% Caucasian)	74.1	71.1	54.3	55.8	χ^2 (3) = 40.86, p < .001
Education					χ^2 (6) = 39.56, p < .001
less than HS	19.4	27.2	13.0	25.9	
HS or equivalent	44.2	48.9	26.1	43.7	
some college and above	36.4	23.9	60.9	30.4	
Site					χ^2 (3) = 52.09, p < .001
prison	39.9	47.2	67.4	63.2	
substance abuse	60.1	52.8	32.6	36.8	
PPI					
Gender (% Male)	84.1	60	84.2	89.7	χ^2 (3) = 12.09, p < .01
Race (% Caucasian)	66.5	75	60.8	83.9	χ^2 (3) = 13.14, p < .01
Education					χ^2 (6) = 39.91, p < .001
less than HS	26.3	24	20.2	36.2	
HS or equivalent	47.6	36	37.9	48.3	
some college and above	26.1	40	41.9	15.5	
Site					χ^2 (3) = 36.77, p < .001
prison	48.7	44	65.7	37.9	
substance abuse	51.3	56	34.3	62.1	

Note. PCL-R = Psychopathy Checklist-Revised; PPI = Psychopathic Personality Inventory; F1 = Factor 1; F2 = Factor 2.